Aschwin van der Horst et al., J Chromatogr Sep Tech 2016, 7:5(Suppl)
http://dx.doi.org/10.4172/2157-7064.C1.016

Comprehensive two-dimensional critical chromatography a tool to understand the behavior of random and block copolymers in chromatography

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Random, gradient and block copolymers are behaving differently in commonly used solvents in liquid chromatography. Copolymers show two or more distributions, depending on their topology. Linear polymers and random copolymers can be fully characterized by combining their chemical-composition distributions (CCD) and molecular-weight distributions (MWD); block copolymers can be characterized by their block-length-distribution (BLD). Liquid chromatography at the critical point of adsorption (LC-CC or simply critical chromatography, CC) is a highly useful technique used in polymer LC. The mechanism of CC can be studied by coupling LC with size-exclusion chromatography (SEC) yielding CCxSEC. This technique is often used for the characterization of functionality-type-distribution (FTD) in combination with MWD. What we would like to demonstrate is another approach; two-dimensional critical chromatography (CCxCC). Using this approach, more insight in the composition of random-, gradient- and di-block copolymers is obtained. Also the possibility of obtaining relevant information from the CCxCC analysis of the latter copolymers is investigated. As a step towards a complete understanding of the behavior of block copolymers in liquid chromatography, we are showing the results of a comprehensive method for determining the mutually dependent block-length distributions of the blocks in di-block copolymers. When critical chromatography is used in two-dimensions of a two-dimensional liquid chromatography (LCxLC) set-up, all relevant distributions (the molecular-weight, chemical-composition and block-length distributions (CCD, BLD(A), BLD (B), MWD, conversion and degree of gradient distribution (DGD)) can be determined in one analysis.

Biography

Aschwin van der Horst is a Principal Chemist Analytics in the Analysis, Materials and Instrumentation Laboratory at Nuplex, Bergen op Zoom, Netherlands. He holds an experience of 16 years as a Polymer Analytical Chemist and 11 years of experience in Coating Technology. He published various papers on the analysis and characterization of polymers by Multidimensional Liquid Chromatography and Pyrolysis-Liquid Chromatography. Besides his work at Nuplex, he is also a Guest Lecturer at the Avans Hogeschool Breda on Polymer-, Resin- and Paint Analysis and its characterization.

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